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Case Report
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A Rare Experience of Infective Residual Sheath in the Wall of the Innominate Vein after Extraction of Implantable-Defibrillators

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Background: Cardiac device-related infective endocarditis is an uncommon but potentially fatal complication. Therefore, cardiac devices should be removed as soon as a device-related infection is suspected.

Case Report: A 56-year-old male with a history of arrhythmogenic right ventricular dysplasia with implantable cardioverter-defibrillators (ICDs) 7 years earlier and re-implantation of ICDs due to dysfunction 18 months ago presented with erosion of the ICD pocket with *Pseudomonas bacteremia*. For the past year, only multiple wound debridements were performed. Accordingly, we performed debridement and removal of the generator during this admission; however, bacteremia still persisted. Using transesophageal echocardiography, we detected vegetation on the pacing leads and tricuspid valve in the right atrium. We performed thoracotomy with tricuspid valve repair and pacing wire removal. However, anterior chest pain and refractory bacteremia occurred 3 months later after discharge, and an infectious foreign body in the wall of the innominate vein was detected using chest computer tomography. Thoracotomy was again performed for resection of the innominate vein with the infection source. Postoperative recovery was good, with no systemic infection or bacteremia.

Conclusions: Pacing lead extraction is a common procedure following cardiac rhythm management device-related infection. However, residual foreign body-related bacteremia should be suspected in cases with fever of unknown origin after primary surgery. Preserving the innominate vein with patch repair is a feasible option. However, a postoperative 4-week course of antibiotics is recommended.

Key Words: Fever of unknown origin • Implantable cardioverter-defibrillator • Infectious foreign body • Innominate vein • Open thoracic surgery • Refractory bacteremia

BACKGROUND

The implantation of cardiac rhythm management devices (CRMs) is increasing as the general population ages and new indications are formulated.[1] CRMs include pacemakers, predominantly for bradycardia, implantable cardioverter-defibrillators (ICDs) for the treatment of arrhythmia, and cardiac resynchronization therapy for the treatment of heart failure.

Despite the benefits of CRMs, CRM-related infections are an emerging clinical problem. Incidence rates for cardiac device-related infections range from 0.13-19.9% for pacemakers and 0.0-3.2% for ICDs.[2] Cardiac device-related infective endocarditis, which has a re-

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ported mortality rate of 30-35%, is an uncommon but potentially fatal complication.[3] Here we present a rare complication where the partial sheath of the ICD leads in the wall of the innominate vein caused recurrent bacteremia and sepsis and was identified using chest computed tomography (CT).

CASE REPORT

A 56-year-old man with a history of arrhythmogenic right ventricular dysplasia was admitted to our institution with *Pseudomonas* bacteremia. The patient had been treated with ICDs 7 years earlier and re-implanted ICDs were due for potential dysfunction 18 months ago. He exhibited persistent high fever and skin erosion with discharge from the generator pocket. Only wound debridement was performed multiple times 1 year before this admission for the same condition. We performed debridement and removal of the generator; however, *Pseudomonas* bacteremia persisted postoperatively. Transesophageal echocardiography (TEE) revealed large vegetation on the ICD leads in the right atrium and on the anterior leaflet of the tricuspid valve, with severe regurgitation. The endocardial pacing leads and the tricuspid leaflet were removed using a traditional open-heart surgical approach. A separate incision was used to remove the pacing leads. Cultures of the excised vegetation were positive for *Pseudomonas*. During the same surgery, a tissue tricuspid valve was implanted. Following 4 weeks of postoperative antibiotic treatment guided by antibiogram, the patient was discharged.

Three months after surgery, the patient returned to the hospital with anterior chest pain, recurrent shaking chills and persistent high fever associated with signs of sepsis, despite having received the appropriate antibiotic treatment. Blood culture results were consistent with *Pseudomonas* infection. Series examinations, including echocardiography, TEE, and abdominal sonography failed to identify obvious infection sources. Finally, a chest CT identified a small tube structure (about 3.6 cm in length) in the innominate vein (Figure 1A). An intravascular ultrasound showed material with an acoustic shadow at the 3 o'clock position (Figure 1B). Thoracotomy was reperformed for the resection of the innominate vein and the adhered residual sheath (Figure 1C). Histopathology show a picture of foreign body reaction and dystrophic calcification of the venous tissue (Figure 1D). The patient was discharged after a 4-week course of antibiotic treatment. Postoperatively, the patient recovered well, with no evidence of systemic infection or bacteremia.

DISCUSSION

The most common organism that causes CRM infection is *Staphylococcus aureus*.[4] *Pseudomonas aeruginosa* is uncommon, but not rare in this kind of infection. However, if no other sources of infection can be identified, CRM infection still should be considered. Besides, differentiating between intravenous thrombotic calcification and a retained catheter or partial sheath after removal can be challenging.[5] In this case, repeated erosion of the ICD pocket with wound infection hinted at CRM infection. At first, we only debrided the wound and removed the generator because the procedure for extracting pacing leads was relative risky, and no infectious endocarditis was initially identified. However, fever and bacteremia persisted postoperatively, and TEE showed infectious endocarditis. Thoracotomy was, therefore, in-

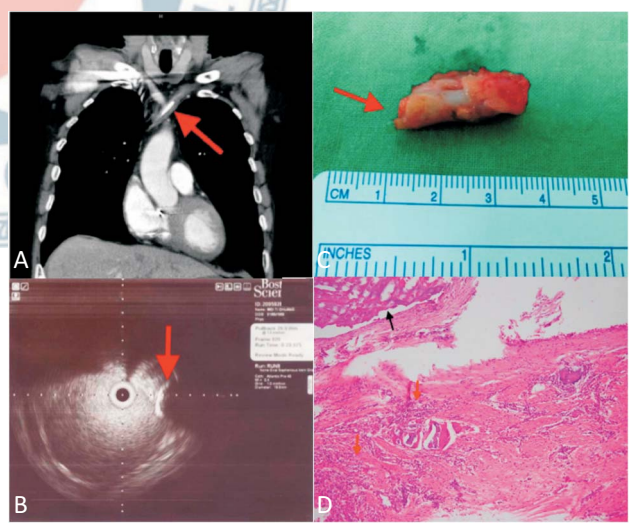

Figure 1. *(A) Chest CT identified a tube structure (about 3.6 cm in length) in the innominate vein; (B) Intravenous ultrasound showed material with an acoustic shadow at the 3 o'clock position; (C) A segment of innominate vein wall adhered with plastic residual sheath; (D) Histopathology show a picture of foreign body reaction with giant cell infiltration (red arrow) and dystrophic calcification (black arrow) of the venous tissue. CT, computed tomography.*

evitable; we removed the pacing leads and replaced the tricuspid valve in the second surgery. Surprisingly, anterior chest pain, recurrent shaking chills and persistent high fever associated with the signs of sepsis as well as *Pseudomonas* bacteremia occurred within 3 months postoperatively. Based on the symptom of chest pain and negative evidence of infection sources, including no more vegetation on the valves, and good healing of the surgical wound, ICD infection related to the residual foreign bodies post extraction of pacing leads should be considered, although there was no radiopaque catheter-like shadow on chest X-ray (Figure 2). We detected a concealed infection source on the chest CT, which the residual lead sheath contained in the wall of the innominate vein was highly suspected. Initially, we consulted a cardiologist regarding the removal of foreign body using an intravenous approach. Intravascular ultrasound revealed material with an acoustic shadow in the vessel wall of the innominate vein, but could not approach it as it was contained in the venous wall; thus, repeated thoracotomy was unavoidable. We preserved the patient's innominate vein by repairing it with a patch after resecting the venous wall that contained the foreign body. Thus, *Pseudomonas* bacteremia was finally controlled.

CONCLUSIONS

We herein have discussed a rare case of an infectious foreign body in the innominate vein wall that was removed by performing open thoracic surgery. Although extraction of pacing leads is a common procedure following CRM infection, complications related to residual foreign bodies in the venous wall such as refractory bacteremia should be considered in cases with fever of unknown origin or refractory bacteremia after primary surgery. Preserving the innominate vein with patch repair is a feasible option, and a postoperative 4-week course of antibiotics is recommended.

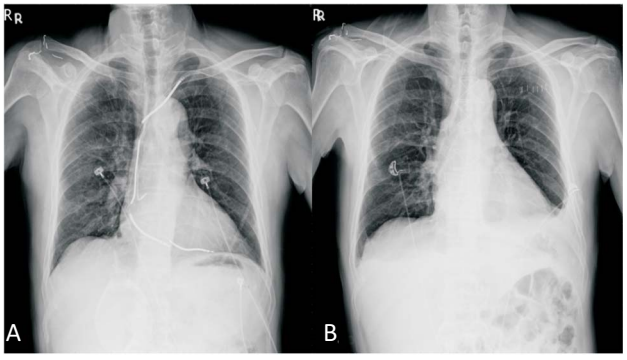

Figure 2. *(A) Chest x-ray after removal of generator; (B) Chest x-ray after operation of pacing wire removal and tricuspid valve replacement.*

LIST OF ABBREVIATIONS

CRMs: cardiac rhythm management devices
ICDs: implantable cardioverter-defibrillators
TEE: transesophageal echocardiography
CT: computer tomography

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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